CLAIMS

What is claimed is:

1. A plant comprising:

an absorber that removes an acid gas from a feed gas using a lean solvent and a semi-lean solvent, thereby producing a semi-rich solvent and a rich solvent;

a first regenerator that receives a first portion of the rich solvent, thereby producing the lean solvent and a first regenerator overhead;

a second regenerator that receives a second portion of the rich solvent, thereby producing the semi-lean solvent and a second regenerator overhead; and

wherein the second regenerator overhead and the semi-lean solvent are substantially exclusively produced from the second portion of the rich solvent.

2. The plant of claim 1 wherein the second portion of the rich solvent is preheated in a heat exchanger against the lean solvent from the first regenerator.

3. The plant of claim 2 wherein the second regenerator further receives steam from a component in the plant.

4. The plant of claim 3 wherein the component is a steam reboiler of the first regenerator and wherein the steam is a flashed steam condensate from the steam reboiler.

5. The plant of claim 1 wherein the absorber operates at a pressure that is lower than an operating pressure of the first regenerator and an operating pressure of the second regenerator.

6. The plant of claim 5 wherein the feed gas comprises flue gas at a pressure of no more than 30 psia.

7. The plant of claim 6 wherein the acid gas in the feed gas is carbon dioxide and has a concentration of between 0.25% (vol.) and 30% (vol.) and wherein the feed gas further comprises oxygen at a concentration of between 0.25% (vol.) and 20% (vol.).

8. The plant of claim 1 wherein the absorber is coupled to an intercooler that receives and cools at least a portion of the semi-rich solvent to form a cooled semi-rich solvent that is re-introduced into the absorber.

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9. The plant of claim 8 wherein at least a portion of the semi-lean solvent is mixed with the semi-rich solvent to form a mixed solvent, and wherein the intercooler cools the mixed solvent to form a cooled mixed solvent that is fed into the absorber.

10. The plant of claim 1 wherein the absorber is coupled to an intercooler that receives and cools at least a portion of the semi-lean solvent to form a cooled semi-lean solvent that is fed into the absorber.

11. The plant of claim 1, optionally comprising an intercooler operationally coupled to the absorber, wherein a power plant or reforming plant is operationally coupled to the plant, and wherein the power plant or reforming plant provides (a) energy for a reboiler of the first regenerator, (b) the feed gas that is fed into the absorber, and (c) wherein the energy is optionally provided by a heat recovery unit that employs duct firing.

12. The plant of claim 11 further comprising at least one of a lean solvent cooler, a semi-lean solvent cooler, and a regenerator condenser, and wherein heat is provided to the power plant by at least one of the lean solvent cooler, the semi-lean solvent cooler, the regenerator condenser, and the intercooler.

13. The plant of claim 1, optionally comprising an intercooler operationally coupled to the absorber, further comprising at least one of a lean solvent cooler, a semi-lean solvent cooler, and a regenerator condenser, wherein a power plant is operationally coupled to the plant, and wherein heat is provided to the power plant by at least one of the lean solvent cooler, the semi-lean solvent cooler, the regenerator condenser, and the intercooler.

14. A plant in which an absorber removes an acid gas from a low-pressure flue gas using a lean solvent and a semi-lean solvent, wherein the lean solvent is produced by a first regenerator operating at a first pressure, the semi-lean solvent is produced by a second regenerator operating at a second pressure, and wherein each of the first and second pressures are greater than a pressure of the low-pressure flue gas.

15. The plant of claim 14 wherein the first and second regenerators receive a first and second portion of a rich solvent, respectively, and wherein the rich solvent is produced by the absorber.

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16. The plant of claim 15 wherein the second portion of the rich solvent is heated by the lean solvent of the first regenerator before the second portion of the rich solvent enters the second regenerator.

17. The plant of claim 14 wherein the second regenerator further receives steam flashed from condensate produced by a steam reboiler of the first regenerator.

18. The plant of claim 14 wherein the absorber is coupled to an intercooler, and wherein the intercooler cools at least one of a semi-rich solvent produced by the absorber and the semi-lean solvent produced by the second regenerator.

19. The plant of claim 14 wherein the low pressure flue gas comprises no more than 30 %(vol.) carbon dioxide and less than 20 %(vol.) oxygen, and wherein the low pressure flue gas has a pressure of no more than 30 psia.

20. The plant of claim 14, optionally comprising an intercooler operationally coupled to the absorber, wherein a power plant or reforming plant is operationally coupled to the plant, and wherein the power plant provides (a) heat for a reboiler of the first regenerator, and (b) the feed gas that is fed into the absorber, and wherein the power plant or reforming plant optionally receives heat from the plant by at least one of a lean solvent cooler, a semi-lean solvent cooler, a regenerator condenser of the plant, and the intercooler.